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Environmental incentives for and usefulness of textual risk reporting: Evidence from Germany*

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Environmental incentives for and usefulness of textual risk reporting: Evidence from Germany

Abstract:

Drawing on distinct German institutional characteristics related to cultural, legal, financial and regulatory features, this paper investigates the extent to which environmental incentives influence German non-financial firms in revealing risk information in their annual report narratives. The paper also examines whether risk-related disclosure (aggregate risk reporting and the tone of news about risk) is useful, by investigating its impact on market liquidity and investor-perceived risk. We find that the decision to provide or withhold such risk information is less likely to be significantly associated with environmental incentives. Among those incentives, we find that German firms are significantly influenced by their underlying risks rather than other factors including ownership structure, capital structure, external equity finance and borrowing. The decision to disclose is likely to be influenced by the size of the firm and whether or not it produces lengthy annual reports. The results also suggest that the impact of aggregate risk reporting levels was not observable until a distinction was made between bad and good news about risk. Specifically, we find that the German market tends to positively (negatively) price good (bad) news about risk by either improving (worsening) market liquidity through removing (creating) information asymmetries, or reducing (increasing) investor-perceived risk.

Keywords: Aggregate risk reporting; good and bad news about risk (tone); investor-perceived risk; market liquidity; textual analysis.

JEL classification: D8; G24; G12; M4

1. Introduction

Traditionally, the literature on corporate disclosure indicates that the level of disclosure in debt-oriented countries (e.g. Germany) is lower than that in equity-oriented countries (e.g. the US and UK), since firms from the former countries have disincentives to reveal information in their annual report narratives (Evans, Eierle, & Haller, 2002). The findings of work by Hofstede (1991, 2001), and subsequently Gray (1988), concur with this. Countries that are characterized by high levels of uncertainty avoidance and low levels of individualism, such as Germany, are expected to have low levels of disclosure (Doupnik & Tsakumis, 2004). In contrast to that argument, current practice shows that German firms tend to provide high levels of risk reporting. For example, KPMG (2013: 27) states that “... for many years, German companies have had to report on risks, but it often doesn’t provide much help in deciding whether to buy a company’s stock.” Furthermore, Elshandidy, Fraser, & Hussainey (2015) find that German firms tend to provide higher levels of risk information than UK firms.

This phenomenon gives rise to two questions. The first concerns *whether and to what extent risk information is principally associated with distinctly German features*. The importance of this question stems from the current work on international convergence, to which efforts underlying institutional differences can still act as major obstacles. Given the number of countries adopting the International Financial Reporting Standards (IFRS), much work is needed to explore the extent to which international differences will survive in this new era (Nobes, 2006). The German accounting system possesses a unique set of features, particularly as *Handelsgesetzbuch* (HGB – or the Commercial Code) accounting still dominates (see Fülber & Klein, 2013). First, the German accounting system follows the continental European accounting model, in which there is a great reliance on legal form (the form-over-substance approach) (Nobes & Parker, 2016). Second, German Accounting Standard (GAS) No. 5 requires German firms to reveal information about their risks that is reliable and relevant for decision making. This, in addition to the IFRS requirements, makes German accounting unique in terms of having a formal and comprehensive standard on risk reporting (Dobler, 2005).

The second question concerns *whether and to what extent the observed risk information is useful*. Answering this question contributes to the ongoing debate around whether narrative sections of annual reports convey useful information to investors. The debate has been addressed within US research (e.g. Kravet & Muslu, 2013; Campbell, Chen, Dhaliwal, Lu, & Steele, 2014) and UK

research (e.g. Abraham & Shrides, 2014; Elshandidy & Neri, 2015). However, little is known empirically about whether German firms are likely to reveal useful risk information to their investors.

This paper adds to the current body of literature concerning the main incentives for risk reporting, since the incentives behind the provision of this information have not been fully explored. In fact, little research, if any, has been conducted thus far on the extent to which German environmental factors might lead firms to disclose risk information in their annual report narratives. One could argue that the mandated approach to risk reporting in Germany (even post IFRS) limits the exploration of potential incentives for risk reporting. However, such reasoning seems to be inconsistent with Dobler's (2008) conclusion regarding the necessity of exploring risk reporting incentives, even in highly regulated countries. To date there appears to be a gap in the literature regarding the extent to which environmental incentives lead to high levels of risk disclosure. This paper contributes to that literature by exploring how environmental factors influence German firms' disclosure of risk information. Prior research (Dobler, Lajili, & Zéghal, 2011; Elshandidy et al., 2015) on risk reporting in Germany does not examine the extent to which German environmental factors affect firms' decisions on whether to disclose risk information (and if so, how), nor does it comment on the usefulness of such information. We rely on the software package QSR version 6 to measure risk reporting by counting the number of statements that indicate risk reporting in the narrative sections of annual reports.¹ In this paper, the term *environmental incentives* is used to refer to the unique environmental factors derived from German institutional characteristics that shape accounting practices (measurement and disclosure). The *environmental incentives* include variables that indicate *risk*, *ownership structure*, *capital structure*, *external equity finance* and *borrowing*.

The paper furthers current research on the usefulness of risk reporting by examining not only the aggregate levels (e.g. Kravet & Muslu, 2013) of risk disclosure but also the impact of the risk reporting tone (good, bad or net tone). To the best of our knowledge, there is no empirical evidence examining whether or not risk information (aggregate risk reporting and either its tone or net tone) has a significant impact on the German market. Moreover, this paper's evidence is distinct

¹ QSR version 6 is an earlier version of NVivo that better suits the data we need to analyse in the sense that it provides the option of using the statement as a coding unit rather than the word, thereby avoiding the problem of double-counting, and advancing the context of textual analyses. More details are provided in Section 4.2.

from that provided within the US context. Early US studies such as Rajgopal (1999) and Hodder & McNally (2001) investigate the impact on the market of market risk disclosure as required by Financial Reporting Release (FRR) No. 48. In observing the market reaction to risk information, those studies rely on an indirect measure for risk reporting since they posit that the market reaction around the provision of the 10-K report, prior to and after the release of FRR 48, indicates its usefulness. Consistent with recent US research (Kravet & Muslu, 2013; Campbell et al., 2014), our paper uses textual analysis, a direct measure, to capture not only the aggregate risk reporting but also its tone (whether risk information conveys good or bad news) in respect of market liquidity and investor-perceived risk in a quite different and unique context (Germany). Our paper also answers Kravet & Muslu's (2013) call for further research on textual risk reporting to examine whether and how risk-related disclosure with a negative emphasis, or bad news, has a different impact on users' perceptions. To investigate *risk information usefulness*, our paper utilizes bid-ask spreads and the volatility of stock returns as measures for market liquidity and investor-perceived risk respectively.

Our findings suggest that, on average, almost 18% of the German firms' narrative disclosure investigated was associated with risk. We find that the risk disclosure decision is less likely to be significantly associated with environmental incentives. Amongst those incentives, we find that German firms are significantly more influenced by their underlying risks rather than other factors (i.e. ownership structure, capital structure, external equity finance and borrowing). Additionally, we find that the disclosure of risk information is moderately influenced by factors such as the dividend payout. However, we find that the key drivers of the provision of risk information, economically and statistically, are a firm's size and the length of its annual report. These results have both theoretical and practical implications as they contribute to the ongoing debate around the extent to which distinct traditional characteristics of the German context continue to influence accounting practices (Dittmann, Maug, & Schneider, 2010), even after the international convergence that has occurred following Germany's mandatory adoption of IFRS.

The results also suggest that the impact of aggregate risk reporting levels is not observable until a distinction is made between bad and good news about risk. Our results suggest that, on average, German firms tend to be marginally less (more) optimistic (pessimistic) when conveying information related to their risks. We find that the German market tends to positively (negatively) price good (bad) news about risk by either improving (worsening) market liquidity through removing

(creating) information asymmetries, or reducing (increasing) investor-perceived risk. These results emphasize the importance of distinguishing between good and bad risk-related news in aggregate risk reporting, particularly when investigating the usefulness of either general disclosure (as recommended by Kothari, Li, & Short, 2009) or risk disclosure (see Kravet & Muslu's 2013 call).

The remainder of this paper proceeds as follows. The distinct factors of the German context are discussed in the following section. Section 3 develops the hypotheses related to the main determinants and to the usefulness of risk-related disclosure. Sample selection, data collection, the steps of the automated textual analysis and the empirical model are then introduced in Section 4. Section 5 discusses the results, further analyses and robustness checks. Section 6 concludes, providing academic and practical implications and suggesting avenues for future research.

2. Institutional background of German context

This section discusses the distinct characteristics within the German context that can be captured through its cultural, legal, financial, and regulatory aspects.

With regard to *cultural aspects*, it has been argued that national culture is an important element in explaining differences in accounting practices, including measurement and/or disclosure (Nobes, 1998). One of the most widely used frameworks for culture is that provided and developed over the years by Hofstede.² Based on Hofstede's scores, *individualism* and *uncertainty avoidance* seem to be considerably different in Germany than in the US and UK. This reflects the fact that the German national culture places a premium on safety, predictability, hierarchy and high conservatism, when compared to American and British cultures (Haskins, Ferris, & Selling, 1996). The relatively low scores for *power distance* in Germany suggest that its firms will have a higher preference than US firms for authority over individuality. The relatively higher scores for *long-term orientation* in the German culture compared to the British and American cultures indicate Germany's preference for thrift and high levels of saving (Haskins et al., 1996) and reflect a more conservative view of accounting.

² Hofstede's (1991, 2001) cultural dimensions can be interpreted as follows: *Power distance* deals with the fact that individuals in societies are inevitably unequal. It expresses the attitude of the culture towards these inequalities amongst people. *Individualism* concerns the degree of interdependence a society maintains among its members. *Uncertainty avoidance* relates to the way a society deals with the fact that the future is uncertain. *Long-term orientation* concerns the extent to which a society shows a pragmatic future-oriented perspective rather than a conventional historical short-term point of view.

Gray (1988) argues that the content of accounting information is also closely linked to cultural values. Doupnik & Perera (2011) find that positive linkages between strong uncertainty avoidance and secrecy follow from a need to restrict disclosure so as to avoid conflict and competition and preserve security. Further, having a preference for collectivism directs accounting practices towards secrecy, with the primary aim of avoiding any conflicts of interests between insiders rather than outsiders. Fülbiér & Klein (2015) argue that accounting conservatism can be justified by uncertainty avoidance, which is traditionally more pronounced in Germany than in the US and the UK (Gray, 1988). They further argue that this approach may also add to Germany's preference for well-organized systems with legally binding accounting rules and institutionalized procedures to cope better with risk and uncertainty over future events.

With regard to *legal aspects*, prior research distinguishes between two legal systems. The first is the common law system in which accounting practices focus on the usefulness of accounting information and the protection of investors (Nobes, 1998). The second, the code law system, subjects firms to specific rules and procedures that are explicit and detailed in relation to measurement and/or disclosure practices, with an emphasis on protecting creditors. According to La Porta, Lopez-de-Silanes, Shleifer, & Vishny (1998), Germany is an example of a code law country.

With regard to *financial aspects*, Nobes (1998) argues that the financial system is a key driver of variations in accounting practices. He identifies three financial systems: (1) *the capital-market-based system*, in which prices are established in competitive markets (UK and US), (2) *the credit-based system: financial institutions*, in which banks and other financial institutions are dominant (Germany), and (3) *the credit-based system: governmental*, in which resources are administered by the government (France and Japan). In any given finance system, he makes links between type of finance (strong credit versus strong equity) and ownership (insiders versus outsiders). Germany is classified as a typical country that relies on strong credit and insiders (the government, banks, families, and other companies).

Nobes & Parker (2016) characterize countries such as Germany (as opposed to countries such as the US and UK) as having code (common) law systems, weaker (stronger) equity markets, a great reliance on debt (equity), which is likely to be provided by banks (the stock market), and a great reliance on insider (outsider) ownership, such that the attention will be on creditors' or

stakeholders' (investors' or shareholders') protection. This conclusion is consistent with La Porta et al. (1998). Nobes (1998) argues that credit-based countries will be more concerned with the protection of creditors and therefore with the prudent and reliable calculation of distributable and taxable profit. Nobes & Parker (2016), Fülbier & Klein (2015) and Doupnik & Perera (2011) find that credit-insider financing systems are likely to be associated with code law countries. Fülbier & Klein (2015) also argue that creditor protection and the determination of distributable profits and objectivity for the sake of reliable and verifiable accounting have emerged as core principles of such systems.

With regard to the *regulatory aspects* of risk reporting, in 2001, the German Accounting Standards Board (GASB) published GAS 5 on risk reporting, which makes Germany unique in being the only country to have formally issued a comprehensive accounting standard in this area. As a consequence, Dobler (2005, 2008) argues that the German experience may have influenced worldwide accounting professionals' efforts to issue a risk reporting accounting standard. The principal objective under GAS 5 is to provide users with information that is reliable and relevant for decision making, allowing those users to form a better understanding of the risks that could affect the future development of a firm (GAS 5: Para 2). While GAS 5 adopts a narrow perspective in defining risk as the possibility of a future *negative* impact on the economic position of a group, it also defines opportunity as the possibility of a future *positive* impact (GAS 5: Para 9). Based on this standard, firms are required to provide disclosure on risks that could affect the decisions of users, and this risk information should focus on risks relating to the specific circumstances of the group and its business activities. This standard requires an appropriate description of risk management to be provided, including the policies, procedures and organization of risk management systems.

GAS 5 emphasizes the disclosure of firms' residual risks, in particular industrial and market risks, or any other risks having a significant impact on firms' existence. All such disclosure should be made in firms' annual report narratives, including a section on Risks and Opportunities or Outlook. Despite the fact that listed German firms are formally required to fully adopt IFRS, the Accounting Standards Committee of Germany (ASCG) also requires those firms to adopt the main risk

reporting requirements under GAS 5.³ The ASCG states that “enterprises applying international accounting principles shall continue to apply German Accounting Standards (GAS) to the extent international accounting principles do not include any requirements. This holds especially for the German Accounting Standards concerning risk reporting and management reporting” (GAS 5).⁴

Taken all together, and as illustrated in Figure 1, we derive the key environmental factors (*risk, ownership structure, capital structure, external equity finance and borrowing*) from the principal distinct institutional features in Germany. The following section investigates the question of how and to what extent *firms’ riskiness* and the nature (*capital structure* and *ownership structure*) and type of their funding (*external equity finance* and *borrowing*) influence German firms’ provision of risk information.

[Insert Figure 1 about here]

3. Hypothesis development

3.1. Environmental factors and risk reporting

3.1.1. Firm riskiness

The manager’s decision over whether to reveal or conceal information can be explained partly by specific factors (such as IFRS and GAS requirements) and also on the basis that the German culture tends to score highly on uncertainty avoidance. If firms have high levels of risk, this increases the uncertainty levels for the public and investors. German regulators demand that German firms reveal more risk information than is required by IFRS and GAS 5. According to signaling theory, the managers of German firms are also motivated to disclose more risk information around how they effectively identify and manage their risks, as a signaling device to distinguish themselves from other companies that do not manage risks or do so less effectively.

Consistent with this view, and based on the general disclosure literature, Cormier, Magnan, & Velthoven (2005) find a positive association between German firms’ betas and their environmental disclosure levels. With regard to risk reporting in other contexts, Elshandidy, Fraser, & Hussainey (2013) find that UK non-financial firms are likely to reveal risk information as a response to their underlying riskiness (e.g. market beta). These findings are consistent with those of Campbell et al.

³ It is notable that GAS 5 is linked with some prior regulations in Germany, such as §§ 289(1), 315(1) HGB as amended by the BilReG (the Reform Act on Accounting Regulation) that explicitly require disclosure on risks and opportunities. There are related standards relevant to this area, such as GAS 15 (Management Reporting).

⁴ See the following link that relates to the ASCG frequently asked questions service (number 16) for more details: http://www.drsc.de/service/faqs/index_en.php?ixfaqs_lang=en&ixfaqs_do=index&ixfaqs_do=show_faq&faq_id=16

(2014) for US firms. In terms of risk reporting in Germany, Elshandidy et al. (2015) argue that firms are likely to respond to the pressure that arises from an increase in risk by exhibiting more risk information to meet social expectations and appear socially legitimate. Managers will be motivated to stay consistent with similar firms that respond to high levels of risk by disclosing more risk information. This confirmatory behavior reassures their investors of their ability to identify and manage risks effectively, raising their status. Elshandidy et al.'s findings support the argument that German firms are willing to reveal significant risk information in response to their underlying risks (i.e. market beta). In contrast to this, Dobler et al. (2011) find that systematic risk, measured by market beta, does not greatly alter German firms' propensity to provide risk information. Despite this, Germany's accounting characteristics suggest that German firms are incentivized to produce a high level of risk reporting so as to explain their risk exposure and risk management and thus mitigate the effects of the high tendency for uncertainty avoidance in the German culture. This leads to the formulation of the following hypothesis:

H1a: *Ceteris paribus, German firms' risk levels positively influence the level of aggregate risk reporting.*

3.1.2. Ownership structure

Agency theory suggests that aligning the conflicting interests of a firm's different parties requires it to reveal more information so as to reduce the information asymmetry and monitoring costs among the parties. Corporate disclosure mitigates agency costs that increase (decrease) as a function of the extent of outsider (insider) ownership (Jensen & Meckling, 1976). In a situation in which ownership is dispersed among shareholders, they are likely to have incentives to monitor the management as the benefits of such monitoring will offset the associated costs (and vice versa). Particularly, firms that have higher levels of outsider ownership will have incentives to reveal more risk information than other firms in order to enable those investors to adjust their portfolios. Failing to provide proper risk information (related to the identification, measurement and management of a firm's risks) is likely to increase investors' uncertainty and their required rate of return.

Prior research documents negative associations between the concentration of ownership and general voluntary disclosure (e.g. Haniffa & Cooke, 2002; Wang & Hussainey, 2013). These findings also apply to risk reporting studies, as evidenced by Abraham & Cox (2007). More recently, however, Elshandidy & Neri (2015) did not find concentrated ownership to have a significant influence on risk reporting practices in Italian and UK firms.

Within the German context, Cormier et al. (2005) find that ownership structure, for which they use concentrated ownership (proxied by closely held shares) and foreign ownership (proxied by the proportion of foreign holdings), significantly increases German firms' likelihood of providing environmental information in their narratives. We know very little, however, about how ownership structure influences German firms' risk disclosure. In this regard, and based upon the literature on corporate disclosure, we expect to see a significant association between ownership structure (i.e. outsider ownership, employee-held shares and foreign ownership) within the German context and risk reporting. This leads to the formulation of the following unidirectional hypothesis:

H1b: *Ceteris paribus, German firms' ownership structure influences the level of aggregate risk reporting.*

3.1.3. Capital structure

Fatemi & Luft (2002) provide a theoretical analysis of how capital structure influences risk activities (i.e. identification, measurement and disclosure). They explain that the capacity of a firm's debt is a function of two sequential factors; the stability of cash flows, which in turn determines the required rate of the bondholders. Their analysis identifies situations in which it is necessary to engage in risk activities on the basis of different probabilities of default due to different levels of reliance on debt. In this way, capital structure might be considered a key factor that influences risk reporting, particularly for firms that rely heavily on debt. Firms holding high levels of debt have an incentive to disclose more information in order to protect themselves from potential damage (Skinner, 1994; Beyer, Cohen, Lys, & Walther, 2010).

The extant evidence on the impact of leverage on risk reporting is, however, somewhat mixed. Within the UK context, some empirical research shows that firms will be likely to reveal more risk information if they have higher levels of leverage, as the latter would indicate greater financing risks. Thus, firms disclose information to reduce their investors' uncertainty (Elshandidy et al., 2013; Marshall & Weetman, 2007). In contrast, Linsley & Shrives (2006) find that leverage does not impact on the firm's decision to reveal risk information. Similarly, within the German context, the empirical findings on risk reporting are mixed. Dobler et al. (2011) find a negative association between risk reporting and leverage for German manufacturing firms. They relate this result to "a concealing motive" produced by banks acting as insiders in the German financial setting. Another contrast occurs in a recent study in which Elshandidy et al. (2015) find that German firms are likely

to reveal more risk information voluntarily when they have higher levels of leverage. We thus expect to find an association between risk reporting and the level of leverage as firms hope to reduce the risk associated with the increase in debt usage. This discussion leads to the formulation of the following unidirectional hypothesis:

H1c: *Ceteris paribus, German firms' capital structure influences the level of aggregate risk reporting.*

3.1.4. External equity finance and borrowings

Obtaining cheap external funds is essential for the creation of firm value through a lower required rate of return. Firms could be forced to reject profitable projects if they have difficulty gaining access to appropriate external finance sources. In theory, disclosure can be seen as a tool for mitigating information asymmetry between insiders (whether management or informed investors) and outsiders (either the public or uninformed investors) and therefore reducing the cost of external funds relative to internal funds (e.g. Verrecchia, 1983; Francis, Khurana, & Pereira, 2005).

Firms' decisions over whether or not to disclose more risk information in their narratives can be influenced by many factors. First, the trade-off between the costs and benefits of disclosure must be considered; firms will try to optimize their level of disclosure by comparing the potential damage from revealing proprietary information to the benefits of obtaining lower external funds (e.g. Francis et al., 2005). Furthermore, firms may disclose information in order to reduce adverse selection, as increased disclosure should enhance market liquidity. Korajczyk, Lucas, & McDonald (1991, 1992) argue that the decision to raise capital is likely to be influenced by information asymmetry, and find that firms tend to raise new capital in periods when the information asymmetry between firm insiders and outside investors is low.

Consistent with Nobes (1998) and based on the institutional analysis for the German context discussed in Section 2, borrowing would be a more important source of finance for German firms than equity finance. The impact of borrowing (equity finance) in terms of motivating managers to reveal risk information might rely on two competing arguments. The first is based on the fact that the majority (minority) of German firms' borrowing (equity) comes from banks (investors) that are already invested in the firms. It might be argued, therefore, that there will be a disincentive to reveal more risk information externally, as creditors (investors) would be able to obtain such information from internal (other) sources. The second argument posits that German firms would increase their

level of risk reporting in response to a demand from creditors (investors) that they insure the market against related risks. This leads to the following unidirectional hypothesis:

H1d: *Ceteris paribus, German firms' external equity finance and borrowing influence the level of aggregate risk reporting.*

3.2. The usefulness of risk information

This section examines the impact of aggregate risk reporting levels and tone (good or bad news) on market liquidity and investor-perceived risk. The paper examines market liquidity as it has a strong theoretical link to disclosure (e.g. Diamond & Verrecchia, 1991; Kim & Verrecchia, 1994; Beyer et al., 2010), and liquidity can be measured accurately over a short interval (Christensen, Hail, & Leuz, 2013). Our interest in investor-perceived risk stems from the underlying notion of high uncertainty avoidance as a unique feature of the German culture, as discussed in Section 2.

3.2.1. Market liquidity

Economic theory suggests that firms that provide high-quality voluntary disclosure are likely to decrease information asymmetry and adverse selection, thus improving their stock liquidity (e.g. Diamond & Verrecchia, 1991; Kim & Verrecchia, 1994; Beyer et al., 2010). Bertomeu, Beyer, & Dye (2011) argue that information asymmetry may be successfully decreased by the disclosure of more information, under one or both of the following conditions: the firms' managers have less sensitive information; there is an overlap between the managers' private information and that of the informed traders. Grüning (2011) explains two links between information asymmetry and a firm's stock liquidity. First, if the information is better allocated in the market, the possibility of passive traders making losses will be reduced, which reduces the actual spread. Second, a lower spread motivates passive traders to exit the market since their offers will not attract active traders. This suggests that, with a decrease in the bid-ask spread, the market for the stock will see improved liquidity.

Ball, Robin, & Wu (2003) argue that in code law countries, such as Germany, information asymmetry is likely to be resolved by institutional features such as the close relation between stakeholders, and also the close tie between the management and insider ownership. In such circumstances, there will be a lower demand for high quality public financial reporting and disclosure. They also argue that another related institutional factor that also reduces the demand for

disclosure is the prominence of banks as suppliers of capital, together with the banks' close ties to companies.

Prior risk reporting research within the US context directly measures the information content of risk reporting in the 10-K form required in SEC filings. Campbell et al. (2014) find that a greater quantity (length) of risk factor disclosure (identified as Item 1A – a compulsory requirement of the SEC since 2005) reduces information asymmetry and this increases the market liquidity (as proxied by the bid-ask spread). Based on analyzing 30 types of risk disclosure disclosed in 10-K filings, Bao & Datta (2014) find that two-thirds of these risk types lack informativeness and have no significant influence.

There is no prior empirical evidence on whether risk information will improve the German market liquidity. If German firms provide their investors with risk information in response to environmental or other factors, as posited in the previous hypotheses, then evaluating the usefulness of the content of this information becomes a key empirical question. Answering such a question would be of interest to both German regulators and investors. For regulators, finding evidence on the provision of risk information in an environment that is highly regulated towards risk disclosure would shed light on whether German firms meet their investors' needs or just provide generic disclosures to comply with risk regulations. For investors, it is important to examine whether risk information is reliable and relevant. This can be determined by looking at the degree to which investors will comprehend the information and then incorporate it into their price decisions, something that will ultimately improve market liquidity by reducing information asymmetry between management and investors. Arguably, the mandatory nature of risk information in Germany might support this information being boiler-plate. However, as there is no prior empirical evidence, we formulate the following unidirectional hypothesis:

***H2a:** Ceteris paribus, the level and tone of aggregate risk reporting by German firms is likely to be associated with market liquidity.*

3.2.2. Investor-perceived risk

Revealing information about risk is an essential requirement according to many professional initiatives that have been launched (e.g. in the UK, ICAEW 1997, 1999 and 2011; in the US, FRR 48). Again, the main purpose of disclosing this information is to reduce investors' uncertainty, which

reduces the required rate of return due to the lower level of risk. As explained in the previous section, Germany's high score on uncertainty avoidance could explain the country's highly regulated environment for risk information relative to other countries such as the UK. This makes investor-perceived risk an important indicator to look at in relation to risk information. Making a distinction between good (favorable) and bad (unfavorable) news from three sources – annual reports, analyst reports and the business press – Kothari et al. (2009) use content analysis to analyze the impact on risk measures including the cost of capital, the volatility of stock returns and the volatility of analyst forecast errors. Focusing on the results of corporate reporting, they find that good news disclosure reduces the volatility of stock returns, whereas bad news disclosure seems to lack the credibility to influence the perceived risk, possibly due to such information being out of date. Likewise, Akhigbe & Martin (2008) find that the financial market rewards firms with high disclosure through lower movements in those risk measures (volatility, systematic and unsystematic risk), over either 300 (the long term) or 200 (the short term) days.

Kravit & Muslu (2013) argue that, if risk reporting introduces unknown risk factors, users are likely to change their future predictions and become less confident. This argument suggests that providing risk information could be related to an increase in the level of risk, as may be proxied by the volatility of stock returns. However, another argument claims that if risk reporting does not surprise investors but provides information that is related to known risk factors then such disclosure is likely to increase investors' confidence by reducing perceived risk. Campbell et al. (2014) and Kravit & Muslu (2013) find that risk information levels in Item 1A of the 10-K filings increase investor-perceived risk.

Based on the current evidence from theoretical and empirical research, risk-related information might either increase or decrease the perceived risk, depending on whether the revealed risk information conveys unknown or known risk factors. This discussion leads to the following unidirectional hypothesis:

H2b: *Ceteris paribus, the level and tone of aggregate risk reporting by German firms is likely to be related to investor-perceived risk.*

4. Research method

4.1. *Sample selection and data collection*

We obtained a list of Frankfurt all-share firms from Thomson One Banker. We excluded financial firms, as in prior research (Beretta & Bozzolan, 2004; Elshandidy et al., 2013), because of their distinct regulations and accounting practices. This resulted in an initial list comprising 716 firms (see Appendix 1). Firms whose annual reports were offered only in German (497 firms) were also excluded, leaving 219 firms that provide their annual reports in English (either written completely in English or written in German with an English translation provided by the firm). That choice is consistent with the empirical evidence of Campbell, Beck, & Shrives (2005), who support the use of translated German annual reports since they convey the same context as the originals. Our choice is also consistent with recent research on general disclosure. For instance, Lang & Stice-Lawrence (2015) exclude non-English versions from their textual investigation into the incentives for and market reaction to the contents of annual report narratives following the mandatory adoption of IFRS. Recent research on risk reporting in Germany has also utilized annual reports written in English (Elshandidy et al., 2015; Dobler et al., 2011). Firms cross-listed in the US (five firms) were also excluded as they are subject to cross-regulations on risk reporting (Abraham & Cox, 2007).

The annual reports of the sample were collected from either Thomson One Banker or company websites. All reports were for financial years ending within the period from January 2005 to December 2009. This time period was chosen as IFRS became mandatory for German listed companies in 2005. A number of annual reports were excluded for a variety of reasons. Firms with a fiscal year end other than December 31 (14 firms) were excluded in order to inspect the impact of risk information in an accurate and timely fashion, as it became publicly available, on the market indicators (market liquidity and investor-perceived risk). All annual reports had to be converted into text files in order to be readable by QSR version 6 and those that could not be converted were excluded (15 firms). In addition, we excluded firms that followed the US GAAP during 2005 and 2006 (14 firms), as this option was initially available for German firms as an alternative to the mandatory adoption of IFRS in 2005. Finally, any firm without a complete (five-year) time series of

both annual reports and market data was omitted (28 firms). Consequently, as can be seen from Appendix 1, the total size of the sample is 143 firms (715 firm-years).⁵

4.2. Textual analysis steps

Three successive steps, shown in Figure 2, were utilized to measure the risk-related disclosure scores in the narrative sections of the German firms' annual reports over the five-year period. First, in order to determine the final risk word list, we identified a comprehensive list of risk-related keywords based on three main sources: (1) we built an initial list based on prior academic and professional research on risk concepts (Luhmann, 1996); (2) following similar textual analysis research (see e.g. Elshandidy et al., 2013; Wang & Hussainey, 2013) this word list was expanded with relevant synonyms obtained using Roget's Thesaurus; (3) consistent with Kravet & Muslu (2013), 15 annual report narratives were randomly selected and read to identify additional words indicating risk. Consistent with both academic (Abdel-Khalik, 2013) and professional (GAS 5: Para 9) research on risk reporting, our list of risk words relies on a broad approach to defining risk that encompasses not only the negative side such as potential losses/threats but also the positive side reflecting potential gains and opportunities. To test the extent to which the words featured in the resulting list were in use, an intensive text search, using QSR version 6, was conducted for another 15 randomly selected annual reports. Any words that did not appear in this text search were excluded (words such as dare and diminish). In this way, we identified a final complete risk word list comprising the following terms: risk*, loss*, decline (declined), decrease (decreased), less, low*, fail (failure), threat, reverse (reversed), viable, against, catastrophe (catastrophic), shortage, unable, challenge (challenges), uncertain (uncertainty, uncertainties), gain (gains), chance (chances), increase (increased), peak (peaked), fluctuate*, differ*, diversify*, probable* and significant*. For words followed by the symbol *, we also included derivatives of the original.

Second, we counted all the statements in the narrative sections of the annual reports that contained at least one word from our final list. Counting the number of statements that indicate risk regardless of how many times a certain word is repeated overcomes the problem of double-counting (Kravet & Muslu, 2013), which is an inherent issue of all dictionary-based software

⁵ Those firms represent eight industries (classified according to the Industry Classification Benchmark (ICB)), namely, materials, industrials, consumer goods, health care, consumer services, telecommunication, utilities and technology.

programs (e.g. General Inquiry, which was used by Kothari et al., 2009). This generated a score that we used as a measure of the aggregate risk reporting of each firm.

[Insert Figure 2 about here]

Third, each statement that counted towards the aggregated score for each firm was further classified based on its tone (good or bad news). We did this by reclassifying our original risk word list based on whether each word reflected good news (upside, indicating potential gains) or bad news (downside, indicating potential losses). We identified negative risk reporting scores (bad news about risk) by counting the number of statements that contained at least one of the following words: against, catastrophe (catastrophic), challenge (challenges), decline (declined), decrease (decreased), fail (failure), less, loss (losses), low*, risk*, shortage, threat, unable, uncertain (uncertainty, uncertainties), reverse (reversed). Similarly, we identified positive scores (good news about risk) by counting the number of statements that contained at least one of the following words: chance (chances), diversify*, gain (gains), increase (increased), peak (peaked). Again, for words denoted by the symbol *, we also included derivatives of the original.⁶ Additionally, we recorded the “net tone of risk”, by observing the net difference between good and bad news about risk. Appendix 3 provides examples of each type of risk-related disclosure.

4.3. The reliability and validity of the risk-related disclosure scores

The reliability and validity of the risk reporting scores were checked in three stages. First, we examined the extent to which the final word list captured statements in the firms’ annual report narratives with a risk focus. To this end, we read 30 randomly selected statements from the QSR version 6 output for 15 firms. We found the final risk word list to be very successful (80% on average) in identifying statements indicative of risk. Second, Cronbach’s alpha was used as a statistical test to examine the reliability of the aggregate risk reporting scores and tone of risk (good news, bad news and net tone of risk). This test measures how effectively a data set captures a particular underlying construct. For the computed risk reporting scores, Cronbach’s alpha equalled 92.6%, indicating that internal consistency between the aggregate risk reporting and its tone is high when compared with the generally accepted figure from social science of around 70% (Abraham & Cox, 2007). Finally, we also validated our risk disclosure scores by comparing our word list with that of Kravet & Muslu (2013), who suggest a risk word list containing the following words (where *

⁶ We excluded neutral words that reflected neither the up nor the downside, such as significant, probable, and differ.

implies that suffixes are allowed): can/cannot, could, may, might, risk*, uncertain*, likely to, subject to, potential*, vary*/varies, depend*, expose*, fluctuate*, possible*, susceptible, affect, influence* and hedge*. To that end, and based on that list, we generated risk disclosure scores for our full sample in 2007. Our results show that the correlation between the two lists was significantly high (around 94%), suggesting that the two lists in common capture a large proportion of risk disclosure from the narrative sections of annual reports. Similarity with Kravet & Muslu's (2013) work provides further evidence of our word list's validity and thus we can conclude that our computed disclosure scores are reliable.

4.4. Empirical model

To examine how environmental factors (*firms' riskiness*, nature of funding including *ownership structure* and *capital structure*, and type of funding including *external equity finance* and *borrowing*) affect aggregate risk reporting (*HI*), this paper utilizes the following equation:⁷

$$\left(\begin{array}{c} \text{Aggregate_risk_reporting} \\ \end{array} \right)_{i,t} = \beta_1' \left(\begin{array}{c} \text{Environmental_factors:} \\ \text{Risk} \\ \text{Ownership_structure} \\ \text{Capital_structure} \\ \text{External_equity_finance} \\ \text{Borrowing} \\ \end{array} \right)_{i,t} + \beta_2' \left(\begin{array}{c} \text{Control_factors:} \\ \text{Dividend_payout} \\ \text{Liquidity} \\ \text{Profitability} \\ \text{Growth} \\ \text{Firm_size} \\ \text{Length_of_annual_report} \\ \end{array} \right)_{i,t} + \varepsilon_{i,t} \quad (1)$$

Definitions, measures and sources of all variables are detailed in Appendix 2. We also controlled for other factors that might influence German firm managers' decision to disclose certain risk information in narrative sections of the annual report. These factors included *dividend payout*, *liquidity*, *profitability*, *growth*, *firm size* and *the length of the annual report*.

Dividend payout: German firms might pay relatively higher dividends (vis-à-vis US firms, see Elshandidy et al., 2015) to compensate investors for high risk, and that might affect their level of risk reporting. *Firm liquidity*: Cormier et al. (2005) suggest that highly liquid firms are motivated to disclose more information than less liquid firms. However, findings showed (in line with research by Marshall & Weetman, 2007), that liquidity has a significant and negative impact on the disclosure level. *Firm profitability*: Elshandidy et al. (2013) and Miihkinen (2012) find that poorly performing firms are incentivized to reveal significantly higher levels of risk reporting than profitable firms,

⁷ It is notable that, because we rely on the standardized coefficient approach, the intercept term in both Equation 1 and Equation 2 is equal to zero, since $\beta_0 = \mu_y - \beta_1 \mu_{x1} - \beta_2 \mu_{x2} = 0 - 0 - 0 = 0$.

which is consistent with a German study by Elshandidy et al. (2015). *Firm growth*: Khurana, Raynolde, & Xiumin (2006) argue that, as disclosure enhances the ability to obtain external financing by reducing information asymmetry, firm growth is likely to be positively related to the disclosure level. Their empirical evidence supports this, in line with the work of Chavent, Ding, Stolowy, & Wang (2006). *Firm size*: The theoretical basis for controlling for size, as a firm-specific factor, rests on the fact that providing such information is costly. Large firms are likely to have a greater ability to gather and prepare information to a reasonable level than smaller firms and research to date is consistent with this (Linsley & Shrives, 2006; Miihkinen, 2012). Finally (*Length of annual report*), any observed variation in risk reporting level between German firms might be influenced by the length of the narrative sections of those firms' annual reports (Campbell et al., 2014; Elshandidy et al., 2015). Accordingly, we expect that German firms' dividend payout, liquidity, profitability, growth, size and length of the annual report might all, together or individually, affect the level of firms' risk reporting.

The following equation examines the extent to which the various characteristics of risk-related disclosure (namely aggregate level and tone) are useful by examining the impact on market liquidity and investor-perceived risk (**H2**):

$$\begin{pmatrix} \text{Market_liquidity} \\ \text{Investor_perceived_risk} \end{pmatrix}_{i,t+1} = \beta_1' \begin{pmatrix} \text{Aggregate_risk} \\ \text{_reporting} \end{pmatrix}_{i,t} \text{ or } \beta_1'' \begin{pmatrix} \text{Disclosure_tone:} \\ \text{Good_news} \\ \text{Bad_news} \\ \text{Net_tone} \end{pmatrix}_{i,t} + \beta_2' \begin{pmatrix} \text{Control_factors:} \\ \text{Ownership_structure} \\ \text{Firm_size} \\ \text{BTM} \\ \text{Capital_structure} \\ \text{Risk} \\ \text{Trading_volume} \end{pmatrix}_{i,t} + \varepsilon_{i,t} \quad (2)$$

While all independent variables (risk-related disclosure and control factors) in Equation 2 are measured at fiscal year-end t , the dependent variables (market liquidity and investor-perceived risk) are measured as the average of a three-month (from May to July) period based on daily prices, the bid-ask spread being our proxy for market liquidity (following Campbell et al., 2014) and the volatility of stock returns our measure for investor-perceived risk (following Kravet & Muslu, 2013). These market measures are inspected over those three months so as to ensure that the accounting information is publicly available to investors, since German firms must make their annual reports available four months after their financial year-end (December 31).

All variables common to both equations have the same definition in each, as shown in Appendix 2. Additionally, Equation 2 introduces book to market (*BTM*) and *trading volume* into the set of control variables since they are frequently used in prior research on the usefulness of risk disclosure. Campbell et al. (2014) and Elshandidy & Neri (2015) find a negative association between *BTM* and market liquidity. We therefore control for this factor and expect a negative coefficient. *BTM* is measured as the book value of equity divided by the market value of equity. Leuz & Verrecchia (2000) find that the *trading volume* is negatively associated with the relative spread. The *trading volume* is measured by dividing the daily trading volume, that is, the number of shares traded on day *i*, by the number of outstanding shares.

We relied on ordinary least squares (OLS) regression in both equations, after accounting for both year- and industry-fixed effects in order to control for unobserved industry heterogeneity, since we were interested in observing variations over time: in aggregate risk reporting in Equation 1 and in market indicators (market liquidity and investor-perceived risk) in Equation 2. Furthermore, in both equations the standard errors are heteroskedasticity-adjusted. To mitigate the problem of outliers, our continuous variables are winsorized at the 1% and 99% level. To assess the overall significance for each model, we report F-statistics, the test statistics for the analysis of variance (ANOVA), and indicate their significance, all of which confirm the overall significance of the models. All of the variables' definitions, measures and sources are provided in Appendix 2.

5. Results

5.1. Descriptive statistics

Table 1 presents the descriptive statistics for the dependent (risk reporting in Equation 1 and the market indicators in Equation 2), independent (environmental incentive factors in Equation 1, and risk reporting and its tone in Equation 2) and control variables. Over the five-year period of the study, German firms tended to disclose almost 276 ($2.7182818^{5.620}$) statements indicating risk, on average, based on our final word list. While there were, on average, 106 ($2.7182818^{4.667}$) statements indicating good news associated with risk, there were 112 ($2.7182818^{4.719}$) that indicated bad news. The remainder of the statements (58) were neutral in tone as concerns risk disclosure. Thus German firms, on average, tend to be marginally less (more) optimistic (pessimistic) when conveying information related to their risks. The shape of the aggregate risk reporting graph and its tone, not reported, is negatively skewed, indicating that German firms tend to reduce their

level of risk reporting in certain years; consider, for example, the behavior of German firms during the recent financial crisis (analyzed further in Section 5.4). Furthermore, the length of the narrative sections of the annual reports studied over the five-year period was, on average, 1,556 ($2.7182818^{*}7.350$) statements. Thus, on average almost 18% of that narrative disclosure was related to risk.

[Insert Table 1 about here]

Table 2 provides Pearson correlation coefficients in respect of every variable. It shows a positive association between the level of aggregate risk reporting and its tone, thereby suggesting that German firms significantly use the tone of information to convey messages about risks included within their aggregate risk disclosures. While the optimistic (net) tone of risk was not significantly associated with the total amount of risk German firms tended to reveal in their narrative sections, it was significantly and positively (negatively) related to the good (bad) news disclosed about risk. It is notable that revealing good and/or bad news might be associated with the underlying performance or firm profitability. The results suggest that German firms that perform well (badly) are likely to reveal a considerable proportion of good (bad) news within their risk disclosure. To extend our conclusions based on the correlation analysis for each pair of variables, the following sub-sections discuss the multivariate regression analyses.⁸

[Insert Table 2 about here]

5.2. Results for H1, based on Equation 1: Environmental incentives for aggregate risk reporting

This section addresses the extent to which the environmental factors influence German firms' decision over whether to disclose risk information in their annual report narratives. Our three models referred to in Table 3 answer this question and test our first set of hypotheses. As regards Model 1 (where there is full consideration of all factors), we find that highly risky firms are likely to have a strong incentive to reveal significantly more risk information in the narrative sections of their annual reports (*t-statistic* 2.043 at 5% significance level). Statistically, a one standard deviation (0.362) increase in a firm's riskiness (market beta) would result in a 0.022 ($0.054*0.411$) increase in aggregate risk reporting. Equally, a one standard deviation increase in a firm's riskiness leads to a 0.054 standard deviation increase in aggregate risk reporting. This supports **H1a**. Facing substantial risk

⁸ In order to test whether our variables exhibit the problem of multi-collinearity, we calculate variance inflation factors (VIFs). All VIFs are below 10, ranging between 1.78 and 3.80, which indicates that none of the variables studied suffers from this problem (Campbell et al., 2014).

exposure has a significant influence on managers' decision over whether to reveal or conceal information about their risks. Our result is consistent with the expectation that German firms with higher levels of risk would be likely to provide significantly higher levels of risk information (including details of those risks and how they were being mitigated). Managers will be motivated to provide such information within the German context (bearing in mind the culture of uncertainty avoidance) to avoid potential misinterpretation of their riskiness. These results are consistent with prior literature on risk reporting (e.g. Campbell et al., 2014; Elshandidy et al., 2015).

[Insert Table 3 about here]

Turning to the control variables, as can be seen under Model 1 of Table 3, managers of firms paying lower dividends have incentives to reveal risk information (*t-statistic* -2.305 at 5% significance level). This result is consistent with Elshandidy & Neri's (2015) findings: They argued, based on agency theory, that dividend policies are a way of dealing with agency problems that relate to corporate insiders and outsiders, and thus that high dividend payments are associated with less riskiness and thus lower levels of risk reporting.

As can be seen under Model 1 of Table 3, German firms that are larger and those that have longer annual reports convey more risk information (both at significance levels of 1%). Arguably, larger German firms are likely to have the resources to build strong risk management systems, as a result of which they will be able to manage their risk effectively and will therefore be likely to convey information about their risks in order to make a distinction between themselves and other firms that either do not engage in risk management or do so less effectively. Variations in risk reporting across German firms are significantly attributable to variations in the length of the annual reports, suggesting the importance of controlling for this factor in disclosure studies. This result is consistent with the most recent evidence in the risk reporting literature (Campbell et al., 2014; Elshandidy et al., 2015).

Model 2 of Table 3 also examines the impact of the environmental factors, along with some other factors that strongly reflect managers' incentives (all control factors shown under Model 1 after the omission of firm size and length of annual report), on risk reporting. The three environmental factors that dominate are risk, capital structure and employee-held shares. Among those factors, risk appears to be the most influential of the environmental and control factors in motivating German managers to reveal information about their risks. The impact of risk on the

revealing of risk information is found to be 110% ($|1-0.191/0.090|*100$), 125% ($|1-0.191/0.085|*100$), 65% ($|1-0.191/0.116|*100$) and 1% ($|1-0.191/0.189|*100$) greater than the impacts of employee-held shares, dividend payout, liquidity and capital structure respectively. Furthermore, based on Model 3 of Table 3, we draw the same conclusion after examining the impact of just the environmental factors on risk reporting.⁹

These results have both theoretical and practical implications. On the one hand, they contribute to the ongoing debate around whether and the extent to which the distinct characteristics of the German context influence accounting practices despite the converging influence of IFRS. Our results are relatively consistent with research that documents a moderate influence of German characteristics on German accounting practices (see Dittmann et al., 2010). On the other hand, these results show that distinct environmental barriers could also partly explain the deviations in risk reporting between German firms. This may help us to understand why risk reporting differences exist, and facilitate international efforts towards harmonization.

5.3. Results for H2, based on Equation 2: The usefulness of risk reporting

5.3.1. Market liquidity (H2a)

Model 1 of Table 4 shows that the aggregate risk information does not have a significant impact in terms of improving the market liquidity between participants, suggesting that investors do not incorporate this kind of disclosure into their decision making. It also supports the idea that German firms tend to provide this disclosure in a somewhat “boiler-plate” fashion (i.e. generic disclosures that fail to provide any information content). Firms’ managers are sensitive about bringing private information to the public’s attention as it may incite unwanted actions from third parties (e.g. suppliers, customers or debt holders) that in turn could reduce its cash flows (Verrecchia, 1983). For example, the disclosed information could prompt a review of contractual obligations. In such highly uncertain circumstances, firms may also be disinclined to disclose any information that might harm their competitive position in the market.

⁹ In terms of the main determinants of good and bad news about risk, our unreported results reveal that, while good news is influenced significantly by borrowing, growth, firm and the length of the annual report, bad news is influenced significantly by the dividend payout, profitability, firm size and the length of the annual report.

Once we made distinctions depending on the tone of the aggregate risk reporting, under Model 2 of Table 4, we found that investors reacted to the tone of the news significantly. In particular, investors reacted positively to risk disclosure categorized as good news, leading to a significant improvement in market liquidity (*t-statistic* -2.091 at the 5% significance level). Specifically, a one standard deviation increase in good (bad news) about risk would result in a 0.002 (0.117*0.013) increase (a 0.001, 0.102*0.013) (decrease) in market liquidity. In addition, investors tended to react negatively to the disclosure of risk information associated with bad news, suggesting that German firms that revealed more bad news about risk alerted investors' attention, resulting in a decrease in the market's liquidity (*t-statistic* 2.001 at the 5% significance level). Our result also suggests that market liquidity is more associated with good news than bad news by 15% ($|1 - 0.117/0.102| * 100$), which is consistent with both the theoretical argument of Diamond & Verrecchia (1991) and the empirical results of Grüning (2011). To investigate the impact of the net tone of risk reporting on market liquidity, we adjusted the good news scores by excluding the bad news scores. Model 3 of Table 4 reveals that investors tended to react more sensitively to the net tone of risk – which reflects the optimistic tone of such disclosure as captured by the difference between the good and bad news about risk – than to the aggregate risk reporting. This information seems to convey firm-specific information (*t-statistic* -2.184 at the 5% significance level) which subsequently improves market liquidity. The above results generally support the argument that risk reporting increases market liquidity. These findings lead us to partially accept **H2a**.

[Insert Table 4 about here]

5.3.2. *Investor-perceived risk (H2b)*

Model 4 of Table 4 shows that the German market does not respond to higher levels of aggregate risk reporting by lowering investor-perceived risk. This result is consistent with our findings under Model 1. It is also consistent with the theoretical argument of Barry & Brown (1985) who explain that investors are likely to estimate the risk of firms that provide relatively little information as higher than that of firms that provide more information. Finally, it is consistent with the empirical results of Akhigbe & Martin (2008).

Under Model 5 of Table 4, when we distinguish between the tone of each risk statement, the results reveal that investors are likely to react more significantly to good news (potential gains or opportunities) than they do to bad news (potential losses), and to correct their pre-judgments on the uncertainty related to their investment (*t-statistics* -2.873 for good news and 2.296 for bad news at the

1% and 5% significance levels respectively). Statistically, a one standard deviation increase in good (bad news) about risk would result in a 0.018 (0.134×0.135) decrease (a 0.011, $0.109 \times 0.135 \times 100$) (increase) in investor-perceived risk. The result shows that investors within the German context look more positively (negatively) upon the disclosure of good (bad) news about their risks, and that significantly diminishes (increases) their perceived risk. The impact of good news about risk on investor-perceived risk is 197% ($|1 - 0.134 / 0.045| \times 100$) more than the impact of aggregate risk reporting. Consistent with our findings under market liquidity, the market is likely to react more (by 23%, ($|1 - 0.134 / 0.109| \times 100$)) to good news than to bad news. Our findings for both good and bad news about risk are consistent with the argument of Kravet & Muslu (2013) that risk information might increase (decrease) investor-perceived risk if it conveys unknown (known) information, such as bad (good) news about risk. Furthermore, Model 6 of Table 4 shows that the net tone of risk reporting, which reflects the optimistic tone of that risk disclosure, significantly influences investors by reducing their implied volatility due to their reliance on the revealed information. These findings lead us to partially accept *H2b*.

Collectively, these results have both theoretical and practical implications. Theoretical impacts stem from the importance of distinguishing between good and bad news about risk within aggregate risk reporting, particularly when investigating the usefulness of disclosure in general, as recommended by Kothari et al. (2009), or risk information in particular, thereby answering Kravet & Muslu's (2013) call for aggregate risk information to be further classified according to its tone.¹⁰

5.4. Further analysis

5.4.1. Financial crisis

Due to the fact that the sample period for this paper covers the financial crisis period of 2008, we introduce dummy variables for the periods before, during and after the crisis so as to inspect and compare how German firms behaved during these three periods. Model 1 of Table 5 indicates that, before the financial crisis, German firms tended to provide less risk information than during or after it. These results suggest that the firms appear to have been more concerned with avoiding high non-

¹⁰ To ensure that our analysis has not been driven by any special nature of the year 2005, as a transition year, we reran the analysis without 2005 (thus our sample covers 4 years from 2006 onwards). Consistent with previous findings discussed in Section 5.2, our unreported analysis, which is available upon request, suggests a moderate effect for environmental factors on aggregate risk reporting. It also suggests, consistent with previous findings discussed in Section 5.3, that the usefulness of aggregate disclosure was not statistically and economically observable unless a distinction between good and bad news about risk was made.

compliance costs, which are likely to have become more explicit during and after the financial crisis. This highlights some of the criticism of the regulatory frameworks that tend to appear during and after such crises, as witnessed in the American context by the introduction of the Sarbanes-Oxley Act in 2002 after the Enron and World-Com collapses. These results are in line with recent research on risk reporting in other jurisdictions, such as Miihkinen (2013) in the Finnish context and Elshandidy & Neri (2015) in the UK and Italian contexts.

Model 2 of Table 5 shows that the German firms were likely to provide less good news during and after the crisis than prior to it, even though the coefficients on those two variables of interest (during and post-crisis) are not statistically significant. In contrast to that, the coefficients on the during and post-crisis variables with respect to bad news concerning risk, as can be seen under Model 3 of Table 5, are statistically and economically significant (*t-statistics* 7.146 and 7.550 respectively at the 1% level), suggesting that German firms tended to provide more bad news both during and after the crisis than before it. When we look at the optimism (the difference between good and bad news about risk, i.e. the net tone of risk), our results suggest that German firms tended to be significantly less optimistic both during and after the crisis (*t-statistics* 8.015 and 9.344 respectively) than prior to it.

[Insert Table 5 about here]

5.5. Robustness checks

5.5.1. Changes in risk reporting levels

We inspect whether the deviations in aggregate risk reporting are attributable to the same factors that were identified, based on the *levels* of aggregate risk reporting, in Table 3. Consistent with Kravet & Muslu (2013) and so as to identify either the incentives or the usefulness of firm-specific risk information, we calculate the differences in the aggregate scores, good news and bad news scores and the median of aggregate risk reporting and its tone (good and bad news), between each firm and the scores of other firms within the same industry, over the five-year period. Applying the change model that was implemented in Kravet & Muslu (2013) – in lieu of the risk levels that were implemented in Campbell et al. (2014) and Elshandidy et al. (2015) – reduces the potential endogeneity problems, which will be analyzed further in the following section.

Model 1 (Panel A of Table 6) shows that the observed differences in aggregate risk reporting between firms and its industry counterparts are likely to be associated with risk, within the set of

environmental factors, and by the dividend payout, firm size and length of annual report within the set of control factors. Those factors are the same ones that drove the variations in aggregate risk reporting between German firms, as concluded from our analyses of Model 1 of Table 3.

Models 1 and 4 (Panel B of Table 6) suggest that changes in aggregate risk reporting do not statistically influence investors' decisions. This result is consistent with that drawn from Models 1 and 4 of Table 4. Similarly and consistent with previous results of Models 2, 3, 5 and 6 of Table 4, the results of Models 2, 3, 5 and 6 (Panel B of Table 6) suggest that observed changes in the tone and net tone of risk reporting between German firms and the industry norm are important for investors since they enable them to incorporate such information into their price decisions, demonstrating the usefulness of this kind of information.

[Insert Table 6 about here]

5.5.2. Endogeneity effects

We checked whether our previous estimates, shown in Table 3, were subject to an endogeneity problem arising from omitted variables and/or simultaneity. The problem of omitted variable bias arises from unobserved heterogeneity in firm-specific and/or time-invariant variables. The omitted variables could lead to the incorrect attribution of risk reporting to environmental and/or incentive factors.¹¹ This concern, however, can be eliminated by the use of fixed-effects modeling (Brown, Beekes, & Verhoeven, 2011). To do this, we ran fixed-effects panel regression to investigate the underlying environmental incentives behind the provision of aggregate risk information, as shown under Model 1 of Table 7, and drew the same conclusions as under Model 1 of Table 3.

[Insert Table 7 about here]

Simultaneity or reverse causality arises when significant associations exist between the explanatory variables and risk reporting. To remove the possibility of reverse causality, we used lagged variables. Following Hoitash, Hoitash, & Bedard (2009), we regressed the current year's aggregate risk reporting scores on the previous year's main explanatory variables (environmental and other factors).

¹¹ We collected data on audit quality, as was helpfully suggested by one of the referees. We find that while 451 (72.9%) of German firms were audited by one of the big-four auditors, Ernst & Young, Deloitte, PricewaterhouseCoopers, and KPMG, 167 (27.1%) of German firms were audited by one of the non-big four. In general, our unreported analysis which is available upon request, indicates that audit quality does not significantly influence German firms to provide risk information. Further, we still draw the same conclusion on the main drivers that influence aggregate risk reporting, discussed in Section 5.2. When we introduce audit quality while observing the usefulness of risk information, we find that the impact of aggregate risk reporting, good and bad news about risk on market liquidity and investor-perceived risk remain unaffected by this inclusion.

The coefficients of the lagged values of the environmental and control factors, as shown under Model 2 of Table 7, are generally consistent with our results under Model 1 of Table 3 and have theoretically plausible signs. Our results therefore support the conclusion that environmental factors have a moderate effect in motivating German firms to reveal risk information in their narratives.

5.5.3. Comparisons between German firms and matched firms in other countries

Our results, discussed in 5.2, suggest that risk is essential factor that significantly influences German firms to reveal considerably risk information. This result supports the institutional power of German culture, which places higher effects of uncertainty avoidance. We provide Appendix 4 which tests risk reporting and firms' riskiness in other countries that have different institutional factors from Germany. This appendix shows comparisons of and differences in aggregate risk reporting and risk between German firms and matched firms from UK and Italy.¹² The graphs of Panel A of Appendix 4 suggest that German firms provided more risk information than matched firms in the UK and Italy. They also suggest that risk levels were higher in matched firms from UK and Italy than German firms.

Panel B of Appendix 4 suggests that the means of aggregate risk reporting and risk in German firms are significantly different from the ones observed from matched firms from UK and Italy. Furthermore, our unreported regression analysis, based for matched firms, suggested that while risk significantly influences German firms to exhibit risk information in their narrative sections of annual reports, it does not, however, support significant impact for risk on aggregate risk reporting in matched firms from the UK and Italy. Taken all together, these results suggest that despite the lower levels of risk of German firms than risk levels of matched firms, German firms responded to their risk levels by providing significantly higher levels of risk reporting than those of matched firms.

¹² Our choice for these two countries relied on the following: Elshandidy and Neri (2015) argue that these two countries offer unique sets of characteristics and have very different legal origins, the UK having a strong common-law tradition, and Italy one of civil law. Further differences in institutional settings include the large stock market, dispersed corporate ownership, high level of investor protection and strong legal enforcement in the UK compared with a less developed stock market, concentrated ownership, low level of investor rights and weak legal enforcement in Italy (La Porta et al., 1998).

6. Concluding comments

Making reference to some unique features (e.g. code law, insider market, creditor protection) that distinguish the German context from many others such as that of the US (i.e. common law, outsider market, investor protection), we examine how environmental factors (nature of funding including ownership structure and capital structure, type of funding including external equity finance and borrowing, and riskiness of funding including risk and uncertainty) affect aggregate risk reporting.

The decision to increase the level of risk reporting is influenced by firm risk levels (an environmental factor) and dividends, size and the length of the annual report (control factors). We find that the decision regarding whether to provide or withhold risk information is unlikely to be significantly related to environmental incentives, but is economically and statistically associated with a firm's size and the length of its annual report, while being moderately influenced by factors such as dividends.

These results have both theoretical and practical implications. First, they contribute to the ongoing debate around whether, and if so the extent to which, the distinct characteristics of the German context influence accounting practices despite the converging influence of IFRS. Our results show that distinct environmental barriers could also partly explain the deviations in risk reporting between German firms. This may help us to understand why risk reporting differences exist, and facilitate international efforts towards harmonization. The results also have practical implications for investors and other market participants who are likely to look at certain drivers. For instance, if a firm is risky, large and provides lengthy annual reports, it is highly likely that it will provide significantly more risk information in its narrative sections than other firms. For policy makers, the results shed light on the fact that distinct features (environmental factors) only moderately influence firms' decisions regarding whether to reveal information about their risks.

This paper also examines whether or not risk-related disclosure is useful to the German market. The results suggest that the market is likely to react more sensitively to the tone of risk reporting, than to the aggregate level of disclosure that tends to be "boiler-plate." This adds to the widespread discussion by the regulators, especially in the US and UK, on whether and to what extent corporate disclosure in narrative sections conveys credible and relevant information to investors,

facilitating their decision making and helping them to engage with firms' activities. The results also lend support to annual reports remaining a key source of information for investors.

There are some avenues for future research based on this paper's limitations. This paper relies on narrative disclosure in annual reports; further research might conduct a content analysis on other sources of information such as financial releases, analyst reports and online reports. The investor-perceived risk is implicitly measured based on the impact of risk-related information on the volatility of market returns; however, questionnaires and/or interviews could also be used to explicitly measure investors' real feelings about disclosed information (Koonce, McAnally, & Mercer, 2005). Further research might also investigate empirically how institutional factors across countries influence firms' decision on revealing risk information.

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Table 1. Descriptive statistics

Variables	Observations	Mean	Median	Std. Dev.	Min	Max
Risk-related disclosure:						
<i>Aggregate risk reporting</i>	715	5.620	5.683	0.411	4.890	6.217
<i>Good news about risk</i>	715	4.667	4.705	0.440	3.912	5.293
<i>Bad news about risk</i>	715	4.719	4.753	0.434	3.970	5.357
<i>Net tone of risk</i>	715	-0.052	-0.058	0.301	-1.444	0.841
Market indicators:						
<i>Market liquidity</i>	667	0.021	0.018	0.013	0.005	0.045
<i>Investor-perceived risk</i>	667	0.451	0.441	0.135	0.263	0.685
Environmental factors:						
<i>Risk</i>	715	0.763	0.756	0.362	0.223	1.317
<i>Outsider ownership</i>	715	48.957	49.000	24.522	10.000	85.000
<i>Employee-held shares</i>	715	1.859	1.000	2.248	0.000	6.000
<i>Foreign ownership</i>	715	1.247	0.000	2.074	0.000	6.000
<i>Capital structure</i>	715	2.989	3.494	1.704	0.000	5.062
<i>External equity finance</i>	715	-0.578	-0.061	1.491	-4.375	0.778
<i>Borrowing</i>	715	0.525	0.020	0.671	0.013	2.000
Control factors:						
<i>Dividend payout</i>	715	24.061	22.22	23.686	0.000	64.239
<i>Liquidity</i>	715	1.996	1.750	0.969	0.890	4.070
<i>Profitability</i>	715	9.555	10.62	13.159	-18.360	28.650
<i>Growth</i>	715	0.078	0.045	0.212	-0.248	0.500
<i>Firm size</i>	715	5.370	5.27	0.694	4.427	6.540
<i>Length of annual report</i>	715	7.350	7.375	0.433	6.623	8.034
<i>Book to market (BTM)</i>	667	1.925	1.62	1.045	0.690	3.990
<i>Trading volume</i>	667	0.095	0.057	0.093	0.009	0.292

This table presents descriptive statistics (mean, median, and other relevant statistics) for the dependent variables used to test **H1**, which relates to **aggregated risk reporting**. It also includes dependent variables used to test **H2**: market indicators comprising **market liquidity** and **investor-perceived risk**. The independent variables related to **H1** include environmental factors (**risk**, **ownership** including **outsider and foreign ownership and employee-held shares**, **capital structure**, and **types of financing** including **external equity financing and borrowing**) and control factors (**dividend payout**, **liquidity**, **profitability**, **growth**, **firm size** and **length of annual report**). The independent variables related to **H2** include risk-related disclosure, which includes **aggregate risk reporting** and **its tone**, i.e. whether it is **good or bad news** and the **net tone of the risk information**. The control factors used for the second hypothesis, in addition to those used for **H1**, include the **book to market (BTM)** and **trading volume**. All continuous variables are winsorized at 1% on both tails. Variable definitions, measures, and sources are provided in **Appendix 2**.

Table 2. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) Aggregate risk reporting	1.000																			
(2) Good news about risk	0.821^a	1.000																		
(3) Bad news about risk	0.816^a	0.758^a	1.000																	
(4) Net tone of risk	0.004	0.345^a	-0.349^a	1.000																
(5) Market liquidity	-0.269^a	-0.380^a	-0.203^a	-0.256^a	1.000															
(6) Investor-perceived risk	-0.170^a	-0.211^a	-0.156^a	-0.081^b	0.268^a	1.000														
(7) Risk	0.157^a	0.125^a	0.145^a	-0.027	-0.142^a	0.517^a	1.000													
(8) Outsider ownership	0.068^c	0.032	0.037	-0.007	-0.063^c	0.177^a	0.261^a	1.000												
(9) Employee-held shares	-0.115^a	-0.114^a	-0.137^a	0.031	0.135^a	0.114^a	-0.025	0.079^b	1.000											
(10) Foreign ownership	0.056	0.036	0.087^b	-0.073^b	0.063^c	-0.062^c	-0.051	0.060^c	-0.108^a	1.000										
(11) Capital structure	0.291^a	0.269^a	0.235^a	0.05	-0.188^a	-0.101^a	-0.074^b	-0.001	-0.029	-0.016	1.000									
(12) External equity finance	0.038	0.027	0.047	-0.028	0.135^a	0.115^a	0.108^a	-0.083^b	0.004	-0.009	-0.041	1.000								
(13) Borrowing	0.035	0.051	0.039	0.017	-0.018	0.021	-0.041	0.196^a	-0.015	0.024	-0.088^b	0.034	1.000							
(14) Dividend payout	0.070^c	0.146^a	0.045	0.145^a	-0.334^a	-0.400^a	-0.131^a	-0.026	-0.141^a	0.003	-0.034	-0.063^a	0.026	1.000						
(15) Liquidity	-0.207^a	-0.199^a	-0.168^a	-0.045	0.227^a	0.096^a	0.029	-0.610^a	-0.023	0.027	-0.009	0.095^a	-0.049	-0.047	1.000					
(16) Profitability	-0.027	0.072^b	-0.147^a	0.314^a	-0.317^a	-0.136^a	-0.065^c	0.026	-0.098^a	0.031	-0.063^a	-0.086^b	0.011	0.374^a	-0.131^a	1.000				
(17) Growth	-0.064^c	0.033	-0.121^a	0.221	-0.067^c	0.044	0.057^c	-0.021	0.028	-0.041	0.024	0.045	-0.023	-0.045	0.017	0.137^a	1.000			
(18) Firm size	0.506^a	0.541^a	0.462^a	0.115^a	-0.691^a	-0.396^a	0.053	0.499^a	-0.042	-0.226^a	0.023	-0.142^a	0.048	0.269^a	-0.435^a	0.197^a	-0.026	1.000		
(19) Length of annual report	0.738^a	0.685^a	0.670^a	0.019	-0.293^a	-0.166^a	0.088^a	0.243^a	0.051	-0.088^b	0.019	0.030	0.028	0.154^a	-0.227^a	0.048	-0.071^b	0.442^a	1.000	
(20) BTM	0.022	0.057	-0.089^b	0.214^a	-0.198^a	0.084^b	0.025	-0.068^b	0.007	0.085^b	-0.013	0.017	-0.041	0.072^b	-0.063^c	0.238^a	0.176^a	-0.029	0.052	1.000
(21) Trading volume	-0.243^a	-0.164^a	-0.306^a	0.203^a	-0.079^b	0.304^a	0.119^a	-0.130^a	0.134^a	0.063^a	-0.051	0.053	0.008	-0.149^a	0.143^a	0.001	0.106^a	-0.270^a	-0.172^a	0.036

This table gives the Pearson correlation coefficients between the continuous variables that are related to H1 (risk reporting incentives). Significant coefficients are presented in bold; a, b, and c indicate significance, all for two-tailed t-tests, at the 10%, 5% and 1% levels respectively. All continuous variables are winsorized at 1% on both tails. Variable definitions, measures, and sources are provided in **Appendix 2**.

Table 3. OLS results for the impact of environmental factors on aggregate risk reporting

	ES	Aggregate risk reporting (H1)		
		Model (1)	Model (2)	Model (3)
Environmental factors:				
Risk	(+)	0.054** (2.043)	0.191*** (5.093)	0.176*** (4.867)
Outsider ownership	(?)	0.019 (0.773)	0.047 (1.372)	0.030 (0.880)
Employee-held shares	(?)	-0.002 (-0.072)	-0.090** (-2.522)	-0.091*** (-2.620)
Foreign ownership	(?)	0.018 (0.733)	0.036 (1.047)	0.036 (1.065)
Capital structure	(?)	0.033 (1.055)	0.189*** (4.273)	0.255*** (7.051)
External equity finance	(?)	0.004 (0.158)	0.003 (0.090)	-0.003 (-0.099)
Borrowing	(?)	0.017 (0.728)	-0.019 (-0.543)	-0.022 (-0.612)
Control factors:				
Dividend payout	(?)	-0.069** (-2.305)	0.085** (2.167)	
Liquidity	(?)	0.039 (1.270)	-0.116 *** (-2.676)	
Profitability	(?)	-0.043 (-1.391)	-0.010 (-0.236)	
Growth	(+)	0.014 (0.586)	-0.026 (-0.681)	
Firm size	(+)	0.264*** (6.716)		
Length of annual report	(+)	0.593*** (15.296)		
Year fixed effects		Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes
Adj. R-squared		61.80%	22.70%	21.60%
F values		65.21***	12.28***	13.40***
Observations		715	715	715

This table answers the question of *the extent to which risk information is principally associated with distinctly German features*. It examines the hypotheses related to *H1*. The table gives standardized coefficient estimates and the model summary for OLS regressions of aggregate risk reporting on environmental factors (Model 3) and all (Model 1) or some (Model 2) other control factors. In this and subsequent tables, ES indicates the expected sign (i.e., direction). All continuous variables are winsorized at 1% on both tails. Standard errors are heteroskedasticity-adjusted. t-values are given in parentheses. The symbols *, ** and *** represent the 10, 5 and 1% significance levels, respectively. Variable definitions, measures and sources are provided in **Appendix 2**.

Table 4. OLS results for the impact of aggregate risk reporting and its tone on market liquidity and investor-perceived risk

	ES	Market liquidity (H2a)			Investor-perceived risk (H2b)		
		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Risk-related disclosure							
Aggregate risk reporting	(?)	-0.010 (-0.268)			-0.045 (-1.285)		
Good news about risk	(?)		-0.117** (-2.091)			-0.134*** (-2.873)	
Bad news about risk	(?)		0.102** (2.001)			0.109** (2.296)	
Net tone of risk	(?)			-0.077** (-2.184)			-0.086*** (-2.860)
Control factors							
Outsider ownership	(?)	-0.038 (-1.329)	-0.040 (-1.387)	-0.041 (-1.387)	0.017 (0.616)	0.018 (0.658)	0.018 (0.638)
Employee-held shares	(?)	-0.031 (-1.160)	-0.029 (-1.073)	-0.029 (-1.073)	0.001 (0.031)	0.005 (0.197)	0.006 (0.204)
Foreign ownership	(?)	0.047** (1.988)	0.046** (1.970)	0.046* (1.952)	-0.006 (-0.168)	-0.014 (-0.376)	-0.015 (-0.393)
Firm size	(-)	-0.761*** (-17.301)	-0.748*** (-17.707)	-0.755*** (-18.493)	-0.414*** (-8.087)	-0.405*** (-7.837)	-0.417*** (-7.599)
BTM	(-)	-0.137*** (-4.280)	-0.128*** (-3.868)	-0.129*** (-3.874)	0.086** (2.365)	0.096*** (2.665)	0.097*** (2.667)
Capital structure	(-)	0.180*** (4.311)	0.178*** (4.388)	0.177*** (4.431)	0.172*** (5.512)	0.162*** (5.302)	0.162*** (5.312)
Risk	(-)	-0.070* (-1.785)	-0.070* (-1.810)	-0.071* (-1.823)	0.489*** (13.779)	0.482*** (13.718)	0.481*** (13.821)
Trading volume	(-)	-0.160*** (-5.390)	-0.154*** (-5.078)	-0.154*** (-4.995)	0.117** (2.566)	0.128*** (2.833)	0.130*** (2.859)
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared		55.00%	55.40%	55.50%	48.60%	48.60%	48.70%
F values		46.03***	45.32***	47.44***	33.91***	35.22***	33.32***
Observations		667	667	667	667	667	667

This table answers the question of *whether, and if so to what extent, the observed risk information is useful*. It examines the hypotheses related to **H2**. The table gives standardized coefficient estimates and the model summary for OLS regressions of market liquidity (Models 1, 2 and 3) and investor-perceived risk (Models 4, 5 and 6) on aggregate, good and bad news, and the net tone of risk reporting, respectively. ES indicates the expected sign (i.e., direction). All continuous variables are winsorized at 1% on both tails. Standard errors are heteroskedasticity-adjusted. t-values are given in parentheses. The symbols *, ** and *** represent the 10, 5 and 1% significance levels, respectively. Variable definitions, measures and sources are provided in **Appendix 2**.

Table 5. OLS results for the impact of the financial crisis on aggregate risk reporting and its tone

	E.S	<i>Aggregate risk reporting</i>	<i>Good news about risk</i>	<i>Bad news about risk</i>	<i>Net tone of risk</i>
		Model (1)	Model (2)	Model (3)	Model (4)
Environmental factors:					
<i>Risk</i>	(+)	0.047* (1.827)	0.037 (1.284)	0.007 (0.257)	0.044 (1.178)
<i>Outsider ownership</i>	(?)	0.031 (0.743)	-0.011 (-0.386)	-0.017 (-0.692)	0.009 (0.245)
<i>Employee-held shares</i>	(?)	-0.018 (-0.109)	0.026 (0.942)	-0.013 (-0.524)	0.058 (1.593)
<i>Foreign ownership</i>	(?)	0.019 (0.798)	0.022 (0.861)	0.042 (1.587)	-0.027 (-0.750)
<i>Capital structure</i>	(?)	0.088 (1.004)	0.041 (0.408)	0.007 (0.213)	0.011 (0.239)
<i>External equity finance</i>	(?)	0.005 (0.183)	0.022 (0.814)	0.028 (1.075)	-0.009 (-0.275)
<i>Borrowing</i>	(?)	0.020 (0.844)	0.041* (1.698)	0.016 (0.650)	0.037 (1.106)
Control factors:					
<i>Dividend payout</i>	(?)	-0.072** (-2.406)	-0.028 (-0.993)	-0.075** (-2.490)	0.067* (1.669)
<i>Liquidity</i>	(?)	0.041 (1.343)	0.037 (1.061)	0.046 (1.395)	-0.013 (-0.274)
<i>Profitability</i>	(?)	-0.040 (-1.308)	-0.011 (-0.359)	-0.127*** (-4.219)	0.166*** (4.075)
<i>Growth</i>	(+)	0.012 (0.531)	0.062** (2.266)	-0.020 (-0.784)	0.121*** (3.259)
<i>Firm size</i>	(+)	0.262*** (6.681)	0.357*** (8.265)	0.315*** (7.662)	0.067 (1.348)
<i>Length of annual report</i>	(+)	0.605*** (16.503)	0.532*** (13.092)	0.509*** (13.113)	0.045 (1.228)
<i>During financial crisis</i>	(?)	0.074*** (3.371)	-0.007 (-0.302)	0.175*** (7.146)	-0.263*** (-8.015)
<i>Post financial crisis</i>	(?)	0.088*** (3.007)	-0.049 (-1.598)	0.212*** (7.550)	-0.377*** (-9.344)
Industry fixed effects		Yes	Yes	Yes	Yes
Adj. R-squared		61.70%	55.20%	59.20%	26.1%
F values		70.89***	57.26***	78.47***	12.30***
Observations		715	715	715	715

This table provides standardized coefficient estimates and the model summary for OLS regressions of the impact of the financial crisis on aggregate risk reporting and its tone (good and bad news about risk, and net tone of risk). Two dummy variables, during and post the crisis, are introduced relative to the period prior to the crisis. “During the crisis” takes a value of 1 if the time period is 2008 and 0 otherwise. “Post the crisis” takes a value of 1 if the time period is 2009 and 0 otherwise. ES indicates the expected sign (i.e., direction). All continuous variables are winsorized at 1% on both tails. Standard errors are heteroskedasticity-adjusted. t-values are given in parentheses. The symbols *, ** and *** represent the 10, 5 and 1% significance levels, respectively. Variable definitions, measures and sources are provided in **Appendix 2**.

Table 6. OLS results for the impact of environmental factors on changes on aggregate risk reporting and their usefulness

Panel A: Incentives			Panel B: Usefulness							
	E.S	Δ Aggregate risk reporting		E.S	Market liquidity			Investor-perceived risk		
		Model (1)			Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Environmental factors:			Risk-related disclosure:							
<i>Risk</i>	(+)	0.044** (2.043)	Δ Aggregate risk reporting	(?)	-0.013 (-0.268)			-0.056 (-1.285)		
<i>Outsider ownership</i>	(?)	0.016 (0.773)	Δ Good news about risk	(?)		-0.116** (-2.091)			-0.133*** (-2.873)	
<i>Employee-held shares</i>	(?)	-0.002 (-0.072)	Δ Bad news about risk	(?)		0.102** (2.001)			0.109** (2.296)	
<i>Foreign ownership</i>	(?)	0.015 (0.733)	Δ Net tone about risk	(?)			-0.078** (-2.184)			-0.087*** (-2.860)
<i>Capital structure</i>	(?)	0.027 (1.055)	Control factors							
<i>External equity finance</i>	(?)	0.003 (0.158)	<i>Outsider ownership</i>	(?)	-0.038 (-1.329)	-0.040 (-1.387)	-0.041 (-1.387)	0.017 (0.616)	0.018 (0.658)	0.018 (0.638)
<i>Borrowing</i>	(?)	0.014 (0.728)	<i>Employee held shares</i>	(?)	-0.032 (-1.160)	-0.029 (-1.073)	-0.029 (-1.073)	0.001 (0.031)	0.006 (0.197)	0.006 (0.204)
Control factors:			<i>Foreign ownership</i>	(?)	0.047** (1.988)	0.047** (1.970)	0.046* (1.952)	-0.006 (-0.168)	-0.014 (-0.376)	-0.015 (-0.393)
<i>Dividend payout</i>	(?)	-0.056** (-2.305)	<i>Firm size</i>	(-)	-0.762*** (-17.301)	-0.749*** (-17.707)	-0.755*** (-18.493)	-0.415*** (-8.087)	-0.405*** (-7.837)	-0.417*** (-7.599)
<i>Liquidity</i>	(?)	0.032 (1.270)	<i>BTM</i>	(-)	-0.138*** (-4.280)	-0.129*** (-3.868)	-0.129*** (-3.874)	0.086** (2.365)	0.096*** (2.665)	0.097*** (2.667)
<i>Profitability</i>	(?)	-0.035 (-1.391)	<i>Capital structure</i>	(-)	0.180*** (4.311)	0.178*** (4.388)	0.177*** (4.431)	0.173*** (5.512)	0.163*** (5.302)	0.162*** (5.312)
<i>Growth</i>	(+)	0.012 (0.586)	<i>Risk</i>	(-)	-0.071* (-1.785)	-0.0718* (-1.810)	-0.071* (-1.823)	0.490*** (13.779)	0.483*** (13.718)	0.481*** (13.821)
<i>Firm size</i>	(+)	0.213*** (6.716)	<i>Trading volume</i>	(-)	-0.161*** (-5.390)	-0.155*** (-5.078)	-0.154*** (-4.995)	0.118** (2.566)	0.129*** (2.833)	0.130*** (2.859)
<i>Length of annual report</i>	(+)	0.478*** (15.296)								
Year fixed effects		Yes	Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects		Yes	Industry fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared		75.30%	Adj. R-squared		55.00%	55.40%	55.50%	48.60%	48.60%	48.70%
F values		118.80***	F values		46.03***	45.32***	47.44***	33.91***	32.82***	33.32***
Observations		715	Observations		667	667	667	667	667	667

This table gives standardized coefficient estimates and the model summary for OLS regressions of the change in aggregate risk reporting on environmental factors, in Panel A. It also gives standardized coefficient estimates and the model summary for OLS regressions of market liquidity (Models 1-3) and investor-perceived risk (Models 4-6) on changes in aggregate risk reporting (Models 1 and 4), good and bad news (Models 2 and 5), and net tone about risk (Models 3 and 6), respectively. Changes (Δ) in aggregate news, good and bad

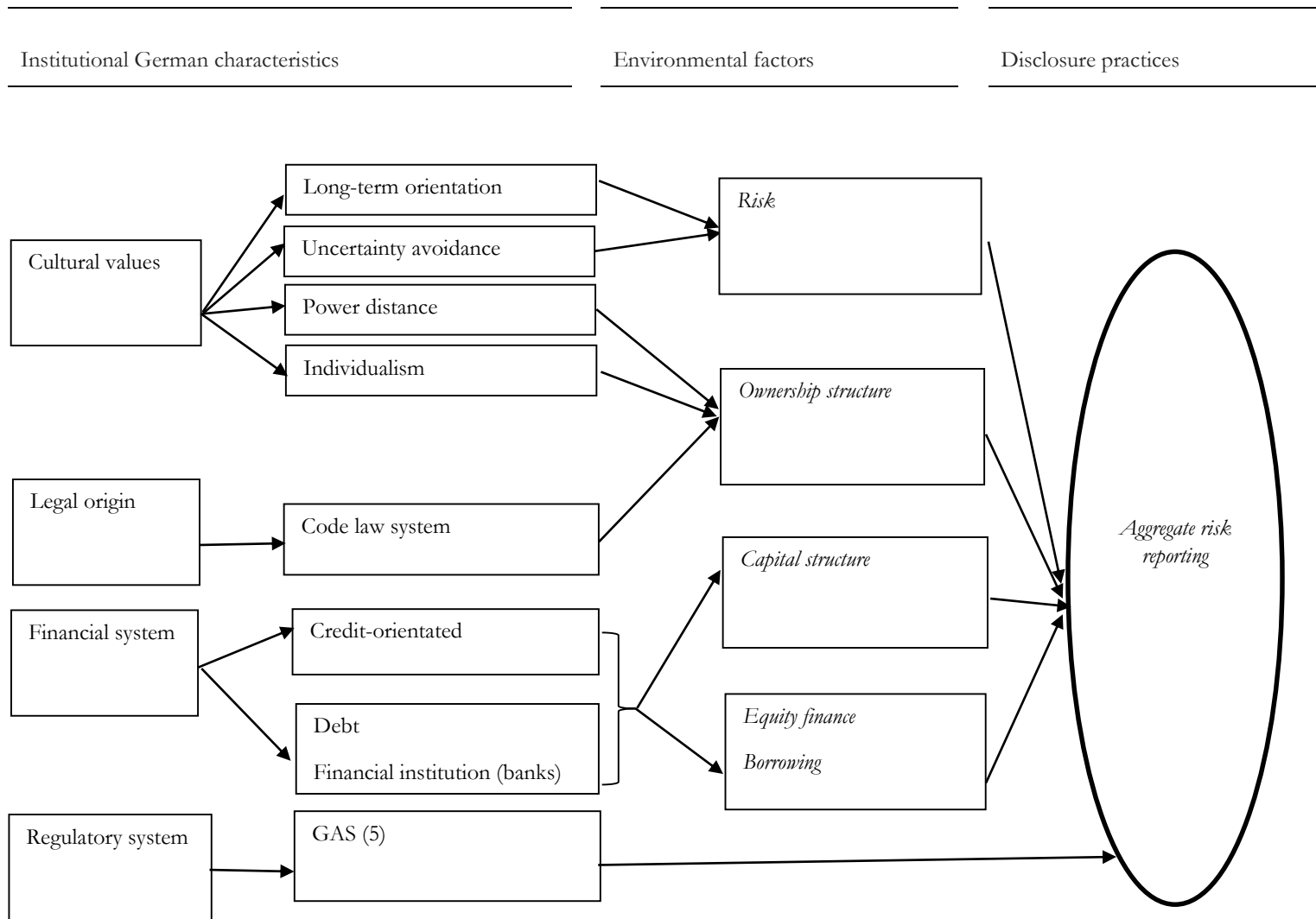
news about risk, and net tone of risk are defined as the differences between a firm's scores and the median score for other firms in the same industry over the years. Variable definitions, measures and sources are provided in **Appendix 2**.

Table 7. Regression results for environmental incentives for aggregate risk reporting after controlling for endogeneity

	ES	Aggregate risk reporting (retest H1)	
		Model (1)	Model (2)
Environmental factors:			
Risk	(+)	0.086* (1.683)	0.079** (1.995)
Outsider ownership	(?)	0.000 (0.104)	0.000 (0.718)
Employee-held shares	(?)	-0.005 (-0.677)	0.004 (0.630)
Foreign ownership	(?)	0.004 (0.700)	-0.004 (-0.596)
Capital structure	(?)	-0.011 (-0.614)	0.025** (2.579)
External equity finance	(?)	-0.004 (-0.555)	0.018 (1.632)
Borrowing	(?)	0.015 (0.814)	0.011 (0.526)
Control factors:			
Dividend payout	(?)	0.000 (0.055)	-0.001* (-1.817)
Liquidity	(?)	-0.010 (-0.654)	0.047*** (3.001)
Profitability	(?)	-0.000 (-0.175)	-0.002 (-1.539)
Growth	(+)	-0.039 (-0.872)	0.079 (1.138)
Firm size	(+)	0.371*** (2.815)	0.242*** (8.333)
Length of annual report	(+)	0.544*** (11.560)	0.366*** (8.548)
Intercept	(?)	-0.394 (-0.607)	1.293*** (4.533)
Year fixed effects		Yes	Yes
Industry fixed effects		NA	Yes
Adj. R-squared		52.5%	39.0%
Observations		715	530

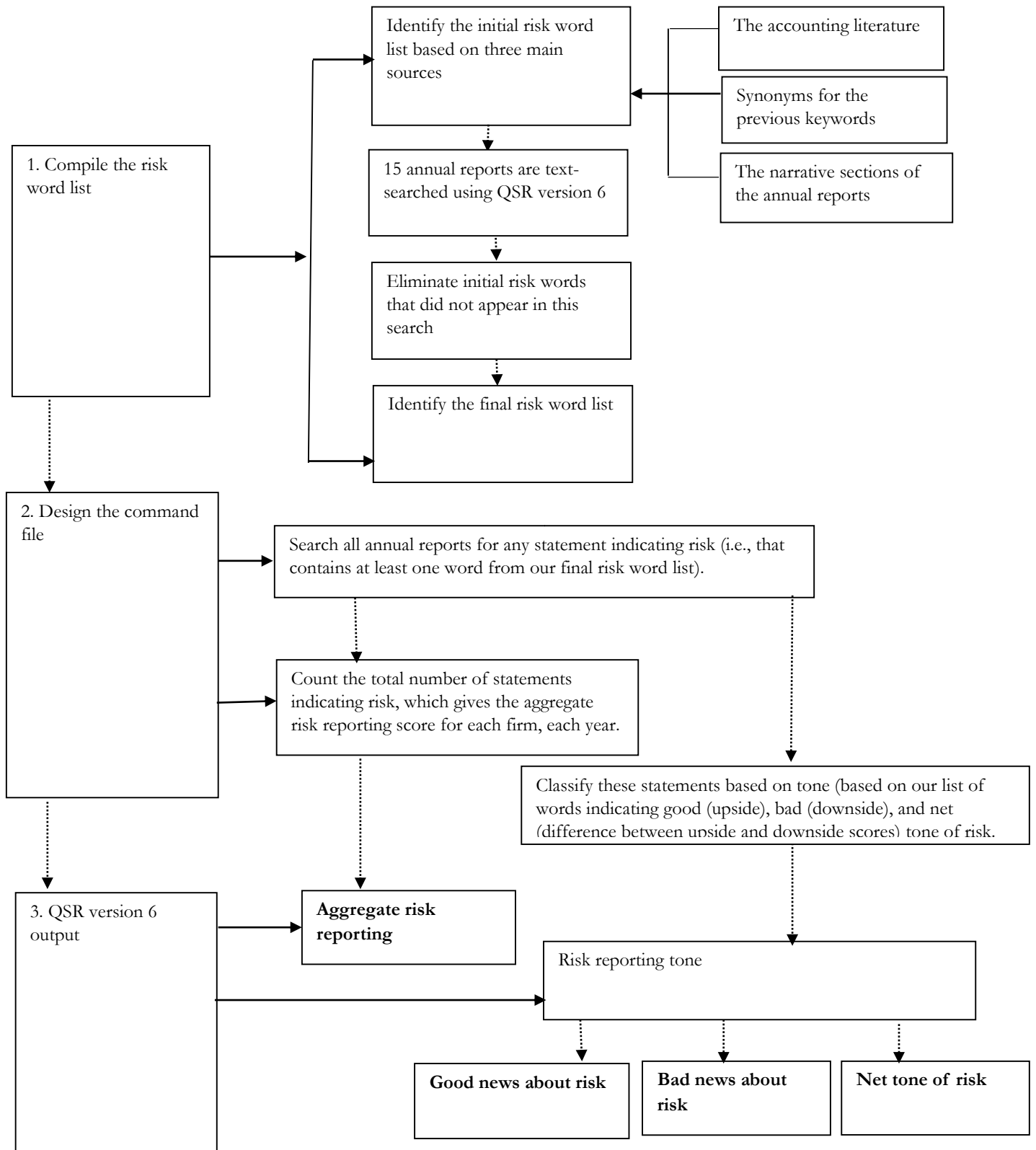
This table re-examines the question of *the extent to which risk information is principally associated with distinctly German features*, previously provided under Table 3, after control for endogeneity. This table provides the unstandardized coefficient estimates of panel regression fixed effects (Model 1), and it also provides unstandardized coefficient estimates for OLS regressions of aggregate risk reporting on lagged environmental and control factors (Model 2). ES indicates the expected sign (i.e., direction). All continuous variables are winsorized at 1% on both tails. Standard errors are heteroskedasticity-adjusted and clustered at the firm level. t-values are given in parentheses. The symbols *, ** and *** represent the 10, 5 and 1% significance levels, respectively. Variable definitions, measures and sources are provided in **Appendix 2**.

Figure 1. Generated principal variables



This figure explains the linkages between German institutional characteristics and the testable environmental factors and their relations to aggregate risk reporting. Variable definitions, measures and sources are provided in Appendix 2.

Figure 2. Automated content analysis steps



This figure describes the three main steps taken to generate risk reporting (aggregate and tone) scores.

Appendix 1. Sample selection	
All-share non-financial firms listed on Frankfurt market, obtained from Thomson One Banker	716
Exclude:	
Firms that provided their annual reports in the German language only	(497)
Cross-listed firms	(5)
Firms without a December 31 fiscal year-end	(14)
Firms with unconvertible (into text) annual reports	(15)
Firms that provided their annual reports under the US GAAP in 2005 and/or 2006	(14)
Firms without a complete time series of both annual reports and market data	(28)
Final sample size (number of firms) in each year	143
Firm-year observations (5*143)	715
This table shows the sample selection procedure	

Appendix 2. Variable definitions

Variable	Definitions, measures and sources
Risk-related disclosure:	
<i>Aggregate risk reporting</i>	All risk information that can be found in the narrative sections of annual reports. This typically relates to the discussion sections that exclude the financial statements but include the notes to the accounts. The scores are generated based on textual analysis using QSR version 6 to count the number of statements that contain at least one word from our final risk word list. The score is the natural log of the number of statements indicating risk in the narrative sections of annual reports. Appendix 3 provides examples of statements that illustrate risk-related disclosure.
Risk reporting tone:	
<i>Bad news about risk</i>	All possible information about risk that reflects bad news in the narrative sections of annual reports. The number of statements indicating risk and conveying bad news is calculated based on textual analysis using QSR version 6. Bad news is identified based on a specific list of words that reflect the downside of risk. The score is the natural log of the number of statements.
<i>Good news about risk</i>	All possible information about risk that reflects good news in the narrative sections of annual reports. The number of statements indicating risk and conveying good news is calculated based on textual analysis using QSR version 6. Good news is identified based on a specific list of words that reflect the upside of risk. The score is the natural log of the number of statements.
<i>Net tone of risk</i>	The net effect of good and bad news about risk, measured as the difference between the scores for good and bad news about risk, as previously calculated.
Market indicators:	
<i>Market liquidity</i>	Measured over three months (from May to July) to ensure that the annual report is publicly available, it is the mean of the relative spread, which is calculated by dividing the difference between the daily ask and bid prices by the average of the daily ask and bid prices. The equation is as follows: $(Bid - Ask Spread) = \frac{1}{Days} \sum_{d=1}^{Days} \frac{Ask - Bid}{(Ask + Bid)/2}$ Required data are obtained from Datastream.
<i>Investor-perceived risk</i>	Measured over three months (from May to July) to ensure that the annual report is publicly available, this is the mean of the volatility (standard deviation) of market returns. Required data are obtained from Datastream.
Environmental factors:	
<i>Risk</i>	Firm risk measured by market beta which captures firm's systematic risk. Market beta was calculated as the covariance of a firm's market return relative to a market index, based on between 23 and 35 consecutive month-end prices of German firms relative to the market returns of the FazAktien index, obtained from Datastream.
<i>Outsider ownership</i>	Measured as Free-float NOSH, which is the percentage of total shares in issue and available to ordinary investors, obtained from Datastream.
<i>Employee-held shares</i>	The percentage of strategic holdings of 5% or more held by employees, or by those with a substantial position in a company that provides significant voting power at an annual general meeting (typically family members), obtained from Datastream.
<i>Foreign ownership</i>	Measured by Free-float foreign holdings, which is the percentage of strategic holdings of 5% or more held by an institution domiciled in a country other than that of the issuer: N.B. Before March 1st 2005 this data type was calculated as a separate strategic component. Since that date, NOSHFR has represented the foreign-held holdings of 5% or more included in the total strategic holdings. This is obtained from Datastream.
<i>Capital structure</i>	Measured as the natural log of leverage. Leverage is proxied by [Long Term Debt + Short Term Debt & Current Portion of Long Term Debt] / [Common Equity] * 100, obtained from Datastream.
<i>External equity finance</i>	Calculated as in Francis et al. (2005) as $[1 - (CFO / CAPX)]$, where CFO is net cash flows from operating activities, and CAPX is capital expenditure. These two items are obtained from Datastream.

<i>Borrowing</i>	The ratio of borrowing expenses - including the amount received by the company due to the issuance of long-term debt (convertible and non-convertible), the increase in capitalized lease obligations, and the debt acquired from acquisitions - to the total sources of funds including the total funds generated by the company internally and externally during the fiscal period, obtained from Datastream.
Control factors:	
<i>Dividend payout</i>	Dividend payout ratio, which is captured as the ratio of dividend per share in the last 12 months to the earnings per share over the last 12 months, obtained from Datastream.
<i>Profitability</i>	Measured by the return on equity (ROE), calculated by dividing net income before preferred dividends by the year-end common equity, obtained from Datastream.
<i>Liquidity</i>	Measured by the current ratio, calculated by dividing total current assets by total current liabilities, obtained from Datastream.
<i>Growth</i>	Measured as the ratio of net sales, $[(sales_{t1}/sales_{t0})-1]$, obtained from Datastream.
<i>Firm size</i>	Measured by the natural logarithm of total assets, obtained from Datastream.
<i>Annual report length</i>	The natural logarithm of the total number of statements coded for the annual report, captured by QSR version 6.
<i>Book to market (BTM)</i>	Measured as the book value of equity divided by the market value of equity, obtained from Datastream.
<i>Trading volume</i>	Measured by dividing the daily trading volume by the number of outstanding shares, obtained from Datastream.

This table provides the definitions, measures and sources for all variables.

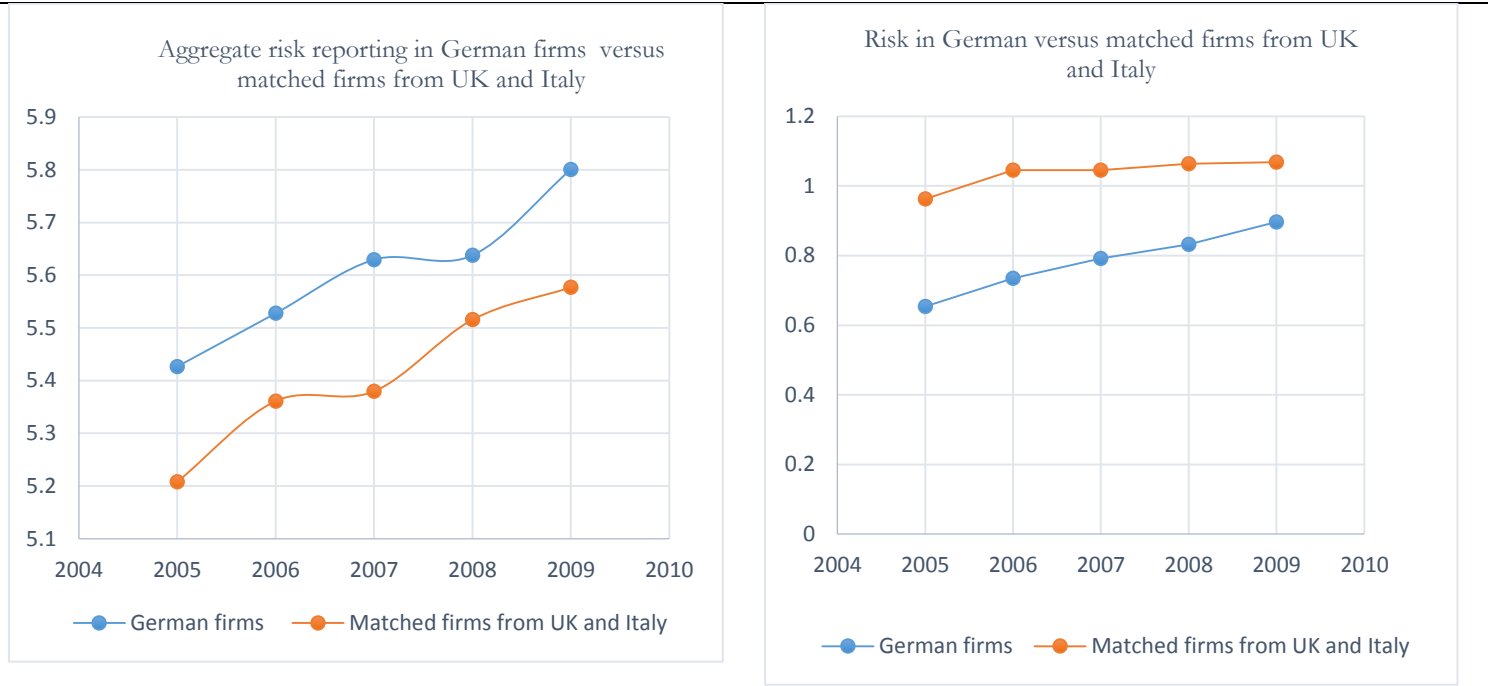
Appendix 3. Examples of risk-related disclosure statements

Firm's examples	code/	Aggregate risk reporting	Bad news about risk	Good news about risk
C000007807 Examples		<p>With the strategic refinement of the company as a lifestyle company with a <i>diversified</i> product portfolio and a stronger focus on retail business, HUGO BOSS was able to <i>increase</i> Group sales by an average of 11% per year between 1997 and 2007.</p> <p>General economic conditions <i>differed</i> widely among the major traditional industrialized nations in 2007.</p> <p>If any of these or other <i>risks</i> or <i>uncertainties</i> occur, or if the assumptions underlying any of these statements prove incorrect, then actual results may be materially <i>different</i> from those expressed or implied by such statements.</p>	<p>The Supervisory Board discussed strategic issues concerning corporate planning, business policy, business development, the <i>risk</i> status and <i>risk</i> management, with the Executive Board.</p> <p>Explanatory notes on the problems of exchange rates: With respect to the import of machine tools, China recorded a <i>decline</i> of 13%, however, it still took first place for the sixth year in a row with € 4.7 billion (previous year: € 5.4 billion).</p> <p>Stock can be explained firstly by the <i>low</i> liquidity of the common shares compared with the significantly higher trading volumes for preferred shares.</p>	<p>In the first half of the year, share prices of both blue chips and small- and mid-cap companies <i>increased</i> steadily thanks to the good economic trend.</p> <p>With the strategic refinement of the company as a lifestyle company with a <i>diversified</i> product portfolio and a stronger focus on retail business, HUGO BOSS was able to <i>increase</i> Group sales by an average of 11% per year between 1997 and 2007.</p> <p>As a result, the HUGO BOSS Group has been able to <i>increase</i> its sales by an average of 11% over the past ten fiscal years.</p> <p>This was largely the result of <i>higher</i> investments in directly owned stores, showrooms, and software, as well as operating and office.</p>
C000007953 Examples		<p>We believe that risk and opportunity management is optimized when <i>risks</i>, <i>risk</i>-compensating measures and opportunities are identified and assessed where they arise, in conjunction with a concerted approach to controlling, aggregating and reporting.</p> <p>Centralized <i>risk</i> management is responsible for the alignment of various corporate functions in the <i>risk</i> and opportunity management process and coordinates the involvement of the executive and Supervisory Boards as necessary likelihood for various <i>risk</i> and opportunity categories.</p> <p>When we find ongoing and serious instances of non-compliance customized <i>risk</i> list for each factory that is monitored.</p> <p>To mitigate system default <i>risk</i>, we believe there is a medium likelihood of losing important individual- Group.</p>	<p><i>Declined</i> as a result of capital market <i>uncertainty</i> from the subprime mortgage crisis.</p> <p>Revenues in North America <i>decreased</i> 3% to 1.275 billion in 2007 from 1.321 billion in 2006.</p> <p>We continue to view a strong <i>reduction</i> of business with one of our brands' biggest our assessment of product quality <i>risk</i> remains unchanged retailers as having a medium likelihood of occurrence.</p>	<p><i>Higher</i> gross and operating margins as well as lower Group (particularly Canada) and Europe.</p> <p>This exercise has allowed us to reduce risk ... enables us to reduce negative consequences that result from <i>increasing</i> efficiency in manufacturing processes and search by simplifying our sourcing structure, and focusing on the sales shortfalls that can occur with key customers.</p> <p>We believe that <i>risk</i> and opportunity management is optimized when <i>risks</i>, <i>risk</i>-compensating measures and opportunities are identified and assessed where they arise, in conjunction with a concerted approach to controlling, aggregating and reporting.</p>

This appendix gives examples of risk-related disclosure (aggregate and tone) statements extracted from the output of QSR version 6. Key risk words are shown in italics.

Appendix 4. Comparisons of and differences in aggregate risk reporting and risk between German firms and matched firms from UK and Italy

Panel A: Comparisons of aggregate risk reporting and risk between German firms and matched firms from UK and Italy



Panel B: Differences in aggregate risk reporting and risk between German firms and matched firms from UK and Italy

Variables of interest	German firms	Matched firms from UK and Italy	Differences
<i>Aggregate risk reporting</i>	5.555	5.395	3.674***
<i>Risk</i>	0.786	1.033	-6.831***
<i>N</i>	712	470	

This appendix presents comparisons of, Panel A, and differences in, Panel B, the mean of *aggregate risk reporting* and *risk* (variable of interest for *H1*) between German firms and matched firms from UK and Italy. We collected data over the period of five years (started from 2005), for non-financial firms in UK and Italy. Definitions, measures and sources of *aggregate risk reporting* and *risk* are provided in **Appendix 2**. The sample of UK and Italy consists of 1,890 firm-year observations (1,450 firm-year observations for the UK and 440 firm-year observations for Italy). We matched firms based on the following firms' characteristics: firm size, length of annual report, liquidity, and profitability. The matched firms constituted 470 firm-year observations from UK and Italy. We examined the differences in these characteristics after matching and we did not find significant differences on these characteristics.